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ABSTRACT

Presented is a description of a study done to assess an undergraduate science methods course. The subjects involved in the study were 82 elementary education majors at Louisiana State University. Students not in the course served as a comparison group. The treatment group participated in science activities selected from ESS, SCIS, and SAPA materials. Students were encouraged to develop individual teaching styles, consider feedback from the instructors and peers, and formulate their own concepts about teaching strategies and roles appropriate for the teaching of elementary school science. The control group discussed topics such as planning for effective teaching, individualizing instruction, and evaluation. Scores on an attitude inventory were used as a premeasure as well as a postmeasure. Scores on Form E of the Rokeach Dogmatism Scale were used as a measure of the belief systems of the students. The dependent variable was teacher attitude; the independent variables were method of instruction and teacher dogmatism. Findings suggested that the instructional method was very effective in changing the attitudes about teaching science. It was noted that these changes due to the treatment were for the most part unrelated to the belief systems of the students. (Author/EB)

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THE EFFECTS OF AN ACTIVITY-CENTERED ELEMENTARY
EDUCATION SCIENCE METHODS COURSE ON THE
ATTITUDES OF PRESERVICE TEACHERS

Paper Presented at the Forty-Ninth Annual Meeting
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THE EFFECTS OF AN ACTIVITY-CENTERED ELEMENTARY
EDUCATION SCIENCE METHODS COURSE ON THE
ATTITUDES OF PRESERVICE TEACHERS

Many of the preservice elementary teachers at Louisiana State University enter the science methods course with negative attitudes about science and science teaching. They are concerned about their ability to teach science to elementary school children because they feel that they don't know enough to teach and because they lack inquiry skills. Typically they view science as a body of knowledge which they are expected to transmit to children, and this idea only adds to their anxiety about teaching what they perceive to be a difficult subject. Their feelings are very similar to those found by Victor (1962) when he studied the reasons given by elementary teachers for being reluctant to teach science.

There is theoretical and empirical support for the idea that students who participate in an activity-centered methods course will develop desirable attitudes toward teaching science in the elementary school (AAAS, 1966; Good, 1971; Mager, 1968). There is also evidence which suggests that the degree of openmindedness of pre- and inservice elementary teachers affects their attitudes about teaching science (Bogut & McFarland, 1975; Dick, 1967) as well as their behaviors (Bird, 1970).

The investigator developed a methods course based on the assumptions that teachers will teach as they are taught and that teachers will be more likely to teach science if they enjoy teaching it, feel confident about using a variety of approaches to the subject,

and believe it to be of practical importance to children. The course was designed, in part, to provide opportunities for students to develop inquiry skills and the feeling that they can help elementary children learn to explore and investigate things around them without being science experts.

The purpose of the study was to examine the effects of the methods course on student attitudes about teaching science in the elementary school and to determine if the effects were a function of the degree of openmindedness of the students. The concept of "attitude" refers to all that a student feels and thinks about a specific topic (Thurstone, 1967). It refers to the disposition of a student to agree or disagree with statements about science and teaching science in the elementary school. Openmindedness refers to the extent to which a person can receive, evaluate, and act on relevant information received from the outside on its own intrinsic merits, unencumbered by irrelevant factors in the situation arising from within the person or from the outside (Rokeach, 1960).

Methods

The subjects were seventy-nine female and three male elementary education majors enrolled in three sections of the undergraduate science methods course at Louisiana State University. These sections were taught by the writer during the 1975 Spring Semester. Forty-five of the students had not participated in field experiences in the public schools, thirty-one had participated for one or two semesters,

and six had participated for three or four semesters. Forty-two female and two male education majors not enrolled in the course served as a comparison group.

Students in the methods course (treatment group) spent approximately twelve hours or 44% of available class time participating in science activities and teaching peers lessons selected from Elementary Science Study (ESS), Science Curriculum Improvement Study (SCIS), and Science-A Profress Approach (S-APA) materials. Teaching styles appropriate for the respective programs were modeled by the writer and by students presenting the activities. Eight hours were spent on ESS lessons, two on SCIS lessons, and two on S-APA lessons. The science activities served as the focal point for everything that was discussed in the course. Students practiced varying their patterns of asking questions and using appropriate evaluation techniques. They were asked to work with children and to observe teachers who were teaching science. They were encouraged to develop individual teaching styles appropriate for various goals of instruction and to formulate their own concepts about teaching strategies and roles appropriate for the teaching of elementary school science.

Students enrolled in two sections of a course entitled Principles of Teaching in the Elementary School (comparison group) taught by another instructor discussed topics designed to give them an overall view of what teaching in the elementary school is all about. They considered topics such as how schools are organized, what is taught, and what children are like. They also observed classroom teachers and worked with small groups of children.

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4
Instruments

An instrument developed by Ronald Good (1971) was used to assess student attitudes. It consisted of thirty statements about the nature of science for the elementary school, the nature of children, and the role of the elementary science teacher. Possible student responses on each statement ranged from +1 (Strongly agree) to +5 (Strongly disagree). The instrument was selected because the writer judged it to be valid in terms of the objectives of the methods course. A test-retest reliability of .74 was obtained when the attitude inventory was administered twice to the same subjects during a three week interval. The subjects were seventy-seven elementary education majors at Louisiana State University not enrolled in the science methods course during the 1975 Spring Semester.

The Rokeach Dogmatism Scale, Form E (Rokeach, 1960) was used to assess the degree of openmindedness of the students. Possible student responses on each of the forty items ranged from +3 (I agree very much) to -3 (I disagree very much). The total score on the D-Scale was the sum of scores obtained on all items after a constant of 4 was added to each item score. Rokeach (1960, p. 90) reported test-retest reliabilities on Form E ranging from .68 to .93 for various groups. Ehrlich (1961) reported a split-half reliability on Form E of .88.

Design and Procedure

A nonequivalent control group design was used in the study (Campbell & Stanley, 1963, Chapter 5). Students in the treatment and comparison groups were pretested with the attitude inventory at the beginning of the semester. Approximately fourteen weeks later, they were posttested with the same instrument and administered the D-3 scale as a measure of openmindedness. The dependent variable in the study was student attitude and the independent variables were the treatment, the set of experiences resulting from enrollment in the science methods course, and the degree of openmindedness of the students.

A 2 X 3 least squares analysis of covariance using pretest attitude scores as the covariable was used to compare group scores for each of the statements on the assessment inventory. Interaction effects between the treatment and high, medium, and low levels of teacher openmindedness were also examined.

Results

It was hypothesized that there would be no statistical difference between the attitudes of students in the treatment and comparison groups. Statistically significant treatment effects were found at the .05 level of probability for 14 of 30 statements on the attitude inventory.

Students in the treatment group agreed and those in the comparison group disagreed that:

1. Science is something you do and a textbook has little place in the elementary school. (Statement #3)

Students in both groups agreed but students in the treatment group agreed to a greater extent that:

1. It's okay for children to play around with science materials for awhile but eventually the teacher must direct their attention to the really important concepts. (Statement #17)
2. The elementary school science teacher should not suggest to a child that he has given a wrong answer as a result of working with equipment during a science "experiment." (Statement #22)

Students in both groups agreed but students in the treatment group agreed to a lesser extent that:

1. When children work with science equipment appropriate for elementary school, they generally need some guidance in determining what should be done with the equipment. (Statement #5)
2. For children who do not properly learn important science concepts and principles in regular classroom sessions, the teacher should help them practice for better understanding. (Statement #11)
3. Teachers who use the lecture and discussion in addition to laboratories in science probably help children to learn more effectively than teachers who use only the laboratory approach (assuming same total time for both cases). (Statement #18)
4. There are certain facts and concepts in science that should be learned by children while they are in elementary school. (Statement #19)

Students in the treatment group disagreed and those in the comparison group agreed that:

1. Demonstrations of scientific principles to a class by a teacher are highly important to children because science equipment is brought into the classroom. (Statement #7)
2. Allowing children to do what they want when working with science equipment would result in many discipline problems. (Statement #8)

3. Written tests are necessary in science to find out if children have learned the concepts and principles studied in class. (Statement #9)

4. The place of the experiment in elementary school science is to verify the validity of previously learned concepts. (Statement #13)

5. To learn science is to learn the concepts and principles already identified by scientists. (Statements #29)

Students in both groups disagreed but students in the treatment group disagreed to a greater extent that:

1. Since society is basically competitive in nature, the use of letter grades should be used in science to be fair to the children in helping them prepare for the future. (Statement #23)

Students in both groups disagreed but students in the treatment group disagreed to a lesser extent that:

1. If a child decides he does not want to do anything with some science equipment available to him, he should have that option of doing nothing. (Statement #25)

It was hypothesized that there would be no statistically significant interaction between the treatment and high, medium, and low levels of openmindedness. This hypothesis was rejected for 2 of 30 statements, a result which could be expected by chance.

Discussion

The complexity of the concept of attitude and the problems involved in attitude measurement should be kept in mind as the results of the study are discussed. Students in the methods course indicated that science is something that children do rather than a body of knowledge that they should read about in a textbook. They viewed experiments in elementary school science as opportunities for children

to find answers to their own questions rather than as exercises to verify the validity of previously learned concepts. They felt that letting children do what they wished with science equipment would not result in discipline problems.

Student responses on several statements were unexpected and in some cases puzzling. The idea that children should be told what to do with science materials if the goal of the teacher is to encourage children to ask their own questions and find their own answers is inconsistent. However, students were encouraged to develop individual teaching styles appropriate for various programs and goals of instruction and this may explain some of their responses. Telling students what to do with materials is appropriate in the SCIS and S-APA programs.

The agreement of students in both the treatment and comparison groups about the place of content in elementary school science was striking. An analysis of responses on a cluster of seven statements reveals that students felt that certain science information exists which should be learned by all children. They agreed that allowing children to play around with science materials is appropriate for awhile, but that eventually the teacher must direct attention to the really important concepts. They indicated that lecture and discussion might be used along with the laboratory approach to help children learn science more effectively. It seems that students in the methods class could not reconcile their feeling that there are certain facts and concepts that should be learned by children in

elementary school with the notion that following the "messing about" phase, children should be helped to move along the different ways that they have chosen to go. It appears that they viewed their role as trying to get everyone on the "right" track after the playing around was finished. They may have been influenced by their perceptions of parental expectations since they agreed that it was important to prepare children for science concepts they must know in Junior and Senior High School.

The finding that there was no statistically significant interaction between the treatment and high, medium, and low levels of openmindedness was somewhat unexpected. The data indicate a strong tendency for openminded students within each group to disagree more than closedminded students on the statements in the assessment inventory, but this effect was not statistically significant.

Conclusions

The purpose of this study was to examine the effects of an activity-centered elementary education science methods course on student attitudes and to determine if the effects were related to the degree of openmindedness of the students. Within the limitations of the study, the findings support the following conclusions:

1. The science methods course had an effect on certain student attitudes.
2. The effect of the course on student attitudes was not dependent upon the degree of openmindedness of the students.

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